CLAIMS

What is Claimed is:

1. A fuel cell distribution system for controlling power applied to a system load, said system comprising:

a fuel cell for generating a draw current, said fuel cell being responsive to a fuel input and an air input;

a power conditioning module responsive to the draw current, said power conditioning module conditioning the draw current and applying a conditioned current to the system load;

a fuel cell sensor for measuring the draw current from the fuel cell, said fuel cell sensor generating a fuel cell signal indicative of the measured draw current; and

a fuel cell controller responsive to the fuel cell signal, said fuel cell controller operating a load following algorithm that determines a command signal applied to the fuel cell that sets the available output power from the fuel cell, said load following algorithm providing a buffer of fuel input and air input to the fuel cell so that the fuel cell is able to immediately generate additional current above the draw current in response to transients from the system load.

2. The system according to claim 1 wherein the fuel cell controller includes a filter for filtering noise in the fuel cell signal.

3. The system according to claim 2 wherein the filter is a first order lag filter that limits filtering of the transients in the fuel cell signal.

4. The system according to claim 2 wherein the filter is selected from the group consisting of Kalman filters, Butterworth filters and notch filters.

5. The system according to claim 1 wherein the load following algorithm averages the fuel cell signal over a predetermined number of sample periods.

6. The system according to claim 5 wherein the averaged fuel cell signal is combined with a buffer signal to provide the extra fuel input and air input.

7. The system according to claim 1 wherein the fuel cell controller includes a rate limiter for limiting the rate at which the fuel input and the air input are applied to the fuel cell.

8. The system according to claim 1 further comprising a battery and a battery current sensor or battery model, said battery providing battery current for the system load and said battery current sensor or battery model measuring the battery current, said battery current sensor generating a battery current signal indicative of the measured battery current.

9. The system according to claim 8 wherein the fuel cell controller is responsive to the battery current signal, said fuel cell controller increasing the available output power if the battery sensor measures a predetermined battery current continuously for a predetermined period of time.

10. The system according to claim 1 further comprising a battery and a battery voltage sensor, said battery providing battery voltage for the system load and said battery voltage sensor measuring the battery voltage, said battery voltage sensor generating a battery voltage signal indicative of the measured battery voltage.

11. The system according to claim 10 wherein the fuel cell controller is responsive to the battery voltage signal, said fuel cell controller monitoring battery voltage drift and determining a charge current applied to the battery.

12. The system according to claim 1 wherein the system provides power to a vehicle.

13. A fuel cell distribution system for controlling power applied to a system load, said system comprising:

a fuel cell for generating a draw current, said fuel cell being responsive to a fuel input and an air input;

a power conditioning module responsive to the draw current, said power conditioning module conditioning the draw current and applying a conditioned current to the system load;

a fuel cell sensor for measuring the draw current from the fuel cell, said fuel cell sensor generating a fuel cell signal indicative of the measured draw current; and

a fuel cell controller responsive to the fuel cell signal, said fuel cell controller operating a load following algorithm that determines a command signal applied to the fuel cell that sets the available output power from the fuel cell, said load following algorithm providing a buffer of fuel input and air input to the fuel cell so that the fuel cell is able to immediately generate additional current above the draw current in response to transients from the system load, said load fuel cell controller including a first order lag filter for filtering noise in the fuel cell signal and limiting filtering of the transients in the fuel cell signal, said load following algorithm averaging the filtered fuel cell signal over a predetermined number of sample periods, wherein the averaged fuel cell signal is combined with a buffer signal to provide the extra fuel input and air input.

14. The system according to claim 13 wherein the filter is selected from the group consisting of Kalman filters, Butterworth filters and notch filters.

15. The system according to claim 13 wherein the fuel cell controller includes a rate limiter for limiting the rate at which the fuel input and the air input are applied to the fuel cell.

16. The system according to claim 13 further comprising a battery and a battery current sensor, said battery providing battery current for the system

load and said battery current sensor measuring the battery current, said battery current sensor generating a battery current signal indicative of the measured battery current, wherein the fuel cell controller is responsive to the battery current signal, said fuel cell controller increasing the available output power if the battery sensor measures a predetermined battery current continuously for a predetermined period of time.

17. The system according to claim 13 further comprising a battery and a battery voltage sensor, said battery providing battery voltage for the system load and said battery voltage sensor measuring the battery voltage, said battery voltage sensor generating a battery voltage signal indicative of the measured battery voltage, wherein the fuel cell controller is responsive to the battery voltage signal, said fuel cell controller monitoring battery voltage drift and determining a charge current applied to the battery.

18. A method for distributing power from a fuel cell to a load, said method comprising:

applying fuel to the fuel cell;

applying air to the fuel cell;

drawing current from the fuel cell to a power conditioning module;

conditioning the draw current in the power conditioning module;

applying the conditioned draw current to the load;

measuring the draw current from the fuel cell; and

providing a command signal to the fuel cell that sets the fuel and air to the fuel cell and the available output power from the fuel cell, said command signal providing a predetermined extra amount of fuel and air to the fuel cell so that the fuel cell is able to generate additional output power immediately in response to an increased demand from the load.

19. The method according to claim 18 further comprising filtering the measured draw current by a first order lag filter.

20. The method according to claim 18 further comprising averaging the measured draw current over a predetermined number of sample periods.

21. The method according to claim 18 further comprising measuring battery current from a battery, and increasing the available output power if the measured battery current is continuously above a predetermined amount for a predetermined period of time.

22. The method according to claim 18 further comprising measuring battery voltage from a battery and a battery voltage sensor, and monitoring battery voltage drift.